

COMPUTER SCIENCE AND ENGINEERING (CSE)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes (https://csprd.louisville.edu/psp/ps_class/EMPLOYEE/PSFT_CS/c/COMMUNITY_ACCESS.CLASS_SEARCH./x/?state=62dab551a0d600a5e8237359c50704e59007&duo_code=sjUx20STj215WVEUQ321YHjhmixpqov).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website (<https://louisville.edu/bursar/tuitionfee/university-fees/>).

CSE 503. Survey of Computer Science and Engineering 3 Units

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): CSE 130.

Description: Introduction to foundations of computer science and engineering for non-majors. Emphasis on C++ programming language, data structures and algorithms, and operating systems fundamentals. This course cannot be taken for credit by students with a degree in computer science

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 504. Automata Theory 3 Units

Term Typically Offered: Fall, Spring

Prerequisite(s): CSE 310.

Description: Finite state machines and their application to engineering problems including modeling the behavior of discrete systems. Topics include theory of computing, formal language theory, and applications of cellular automata. Engineering models of digital computer hardware are covered and related to software design.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 506. Modeling and Analysis of Engineering Systems 3 Units

Term Typically Offered: Fall, Spring, Summer

Prerequisite(s): ENGR 330.

Description: Representation of engineering systems, Fourier analysis, z-transforms, frequency response, state-space analysis, stability, an introduction to the basic theory of filter design, and demonstrated concepts to CAS.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 510. Computer Design 3 Units

Term Typically Offered: Fall, Spring

Prerequisite(s): ECE 210.

Corequisite(s): ECE 511.

Description: Review of logic design and elementary computer organization. Design of the central processing unit, memory, control, and input-output portions of a computer. The VHDL hardware design language will be used.

Note: Cross-listed with ECE 510.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 516. Fundamentals of Computer Communications and Networks 3 Units

Term Typically Offered: Fall, Spring

Prerequisite(s): ECE 360 or IE 360, and CSE 412.

Description: Data communications: The exchange of data between devices is covered. The key aspects of transmission interfacing, link control, and multiplexing are examined. Data communication networking: Examines the internal mechanisms by which communication networks provide a data transfer service for attached devices.

Note: Cross-listed with ECE 518.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 522. Performance Evaluation of Computer Systems 3 Units

Term Typically Offered: Fall Only

Prerequisite(s): IE 360 and CSE 420.

Description: A study of approaches to the evaluation of computer systems. Measurement techniques and evaluation techniques are treated in detail with attention to existing commercial hardware and software monitors and simulators.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 525. Microcomputer Design 4 Units

Term Typically Offered: Fall, Spring

Prerequisite(s): ECE 412 or CSE 412 or consent of instructor.

Description: Design and construction of microcomputers with microprocessors and digital integrated circuits. Breadboarding, hardware design, and software design are emphasized. The class is separated into groups, and each group designs, breadboards, and tests a complete microcomputer system, including interfaces to peripheral devices.

Note: Cross-listed with ECE 516.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 528. Game Design and Programming 3 Units

Term Typically Offered: Spring Only

Prerequisite(s): CSE 302.

Description: This course will provide an overview of Multimedia and Game programming, and teach basic computer game design techniques using state-of-the-art game engines.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 530. Design of Compilers Term Typically Offered: Summer Only Prerequisite(s): CSE 420. Description: Engineering descriptions of algorithmic language. Study of syntax, semantics, ambiguities, procedures, replication, iterations, and recursion in the language. Engineering design of a compiler. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 538. Graph Database and Graph Analytics Term Typically Offered: Summer Only Prerequisite(s): CSE 302. Description: Our world is connected. Data representing real-world problems for analysis, however, usually are discrete and do not explicitly include connected information (relationship or link) in their data models. Graph analytics is the study and analysis of data that can be transformed into a graph representation consisting of nodes (to represent real-world entities) and edges (to represent relationships between entities). Graph analytics is built on the mathematics of graph theory, with augmentation of properties attached to nodes and edges. And graph database systems will be used to build a repository of connected graph data and query the data with a non-procedural graph query language, or an API based on a procedural programming language. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units
CSE 532. Python and Data Analytics Term Typically Offered: Spring Only Prerequisite(s): (CSE 120 or CSE 130) and Junior standing or higher. Description: Python is an interpreted, high-level programming language useful for rapid application development. It supports many modules and packages suitable for tasks ranging from scientific research to business software development. In recent years Python has become a fundamental tool for numerical and data analysis, as well as machine learning. This course has a dual focus of providing users with advanced Python programming skills, as well as experience processing and analyzing data with Python and its libraries. It addresses a variety of topics in a Python programming context, including file management, working with data structures, algorithms and program development, object-oriented programs, and practical problem solutions and applications. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 539. Advanced industrial Software for Home Appliances (part A1) Term Typically Offered: Fall, Spring Prerequisite(s): The student must be participating in the GE Appliance Edison program or employees at GE Appliances enrolled in the CSE program. Description: This course provides graduate students working in the major home appliance industry with an advanced understanding of industrial software engineering and their application to technologies associated with the design, development, and production of major household appliances such as refrigerators, washers, dryers, cooking products and dishwashers. This course serves as one of the curricular elements for the GE Appliance Edison students and is limited to students participating in this program or employees at GE Appliances enrolled in the CSE program. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	4.5 Units
CSE 535. Database Systems Term Typically Offered: Fall, Spring Prerequisite(s): CSE 302 or equivalent. Description: Course covers basics of database design, SQL, query processing, and optimization, transactions. The emphasis will be placed on Engineering design and implementation of relational systems. A written project is required. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 540. Object Oriented Information Technology Term Typically Offered: Fall, Spring, Summer Prerequisite(s): Graduate standing. Description: Survey of design and development of object oriented software. Software architectures, development environments, graphical user interfaces, and networks of distributed objects. Software design project required. Note: CSE students cannot receive credit for CSE 440 and 540. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units
CSE 536. Data Management and Analysis Term Typically Offered: Fall Only Description: The goal of the course is to teach, to the students who are not Computer Science majors, the basic skills needed to organize, assess and analyze data sets. The course discusses a variety of tools (file systems, database systems, and the R environment) as well as a series of basic tasks, from generating metadata to basic filtering, organizing and enrichment of data sets. This course contributes to develop analysis, modeling and problem-solving skills. Note: This course is intended for non-CSE majors. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 542. Computer Control and Real Time Programming Term Typically Offered: Fall, Spring, Summer Prerequisite(s): ECE 412 or CSE 412. Description: Programmable Logic Controllers, Human Machine interfaces, SCADA, state machines, sensors, and actuators. Study of industrial algorithms, open/closed loop real-time control, and schematics. Note: Previously cross-listed with ECE 517. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units

CSE 545. Artificial Intelligence Term Typically Offered: Fall Only Prerequisite(s): CSE 302 and CSE 310. Description: This course introduces the use of predicate calculus logic, heuristic search, and knowledge representations for solving engineering and computer science problems. The course includes coverage of rule-based expert systems, intelligent agents, and machine learning. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 563. Experimental Design in Engineering Term Typically Offered: Spring, Summer Prerequisite(s): ISE 560 (or equivalent) and Graduate standing in the JB Speed School of Engineering. Description: Design of engineering experiments and projects using theory of least squares, analysis of variance, randomized blocks, factorial experiments, nested designs, split plot designs and logistic regression techniques. Covers a combination of analysis by hand and using Minitab statistical software. Students may only receive credit for one of the following: ISE 464, ISE 664, ME 611, and EM 661. Note: Cross-listed with ISE 664.	3 Units
CSE 546. Introduction to Machine Learning Term Typically Offered: Fall Only Prerequisite(s): CSE 532, or IE 360 or equivalent. Description: This course provides a broad introduction to machine learning. This course will cover topics in data pre-processing, regression, classification, clustering, neural networks, ensemble methods, and deep learning. We will learn the fundamental concepts behind several machine learning algorithms without going deeply into the mathematics. We will focus on gaining practical experience applying machine learning to a range of real-world problems. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
CSE 547. Deep Learning Algorithms and Methods Term Typically Offered: Spring Only Prerequisite(s): CSE 532, or IE 360 or equivalent. Description: Deep Learning is an area of Artificial Intelligence and Machine Learning techniques. Its ability to represent objects without the need of extensive feature engineering or pre-defining rules makes it one of the most powerful and flexible frameworks to learn from data. This course covers basic concepts and applications of Deep Learning Techniques. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 564. Introduction to Cryptography Term Typically Offered: Fall Only Prerequisite(s): CSE 310 and IE 360. Description: This course gives a historical introduction to cryptology and the science of secret codes. The first part covers substitution ciphers, transposition codes, Vigenere cipher and more complex polyalphabetic substitutions including those created by rotor machines. The second part describes bit block cipher schemes such as Data Encryption Standard (DES). Public key encryption is the subject of the final part including RSA, Knapsack codes, and Diffie-Hellman key exchange. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units
CSE 550. Software Engineering Term Typically Offered: Fall, Spring Prerequisite(s): CSE 420. Description: Engineering methods applied to the life-cycle issues in the team-oriented development of large software systems including issues of software processes, metrics, testing and quality. Documentation of the project and an oral presentation are required. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 565. Software Security Term Typically Offered: Spring Only Prerequisite(s): CSE 220, CSE 564. Description: This class offers a comprehensive view into software security practices. Students will learn how to develop software with security in mind, learn how to perform static code analysis, fuzz testing, and vulnerability assessments. It will analyze concepts of malware including viruses, adware, rootkits, and others. Students will gain a deep understanding of how software architectures and platforms as a whole must be developed to enhance security in design and development. The relationships to other aspects of cybersecurity in the software development lifecycle will be analyzed. Students will need a basic understanding of cryptography as well as some assembly and high-level (C, Java, Python) language proficiency. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units
CSE 551. Data Visualization for Data Science Term Typically Offered: Spring Even Years Prerequisite(s): CSE 302, CSE 532 This course is all about data visualization, the art and science of turning data into readable graphics. Description: The course aims to introduce key design principles and techniques for interactively visualizing data. The major goals of this course are to understand how visual representations can help in the analysis and understanding of complex data, how to design effective visualizations, and how to create your own interactive visualizations with modern analytics languages. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units	CSE 566. Information Security Term Typically Offered: Summer Only Prerequisite(s): CSE 420. Description: Technical, legal and policy issues associated with information security. Authentication, trusted computer systems, information encryption, biometrics, computer forensics, and privacy issues. Written and verbal reports are required. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	3 Units

- CSE 568. Computer Forensics** **3 Units**
Term Typically Offered: Summer Only
Prerequisite(s): CSE 311 and CSE 420.
Description: Course examines legal, legal, administrative, technical and scientific issues in computer forensics, network forensics, information security and trusted systems. Course requires class participation, lab work, team projects, writing and oral presentations.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 570. Mobile Device Programming** **3 Units**
Term Typically Offered: Spring Only
Prerequisite(s): CSE 220 or equivalent and CSE 335 or equivalent.
Description: This course covers the basic concepts in designing and implementing applications running on Apple's IOS and Google's Android operating systems. Students may not receive credit for both CSE 470 and CSE 570.
Note: Formerly CSE 470.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 590. Special Topics in Computer Science and Engineering** **1-6 Units**
Term Typically Offered: Spring Only
Description: Devoted to topics which usually are not treated in detail in the general courses.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 593. Independent Study in Computer Science and Engineering** **1-6 Units**
Term Typically Offered: Fall, Spring, Summer
Description: Opportunity for the student, under the supervision of a sponsoring faculty member, to pursue individualized study related to research or practice that is not included in regular courses in the curriculum.
Note: Chair Approval is required.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 596. CSE Capstone Design - CUE** **3 Units**
Term Typically Offered: Fall, Spring
Prerequisite(s): Senior Standing, CSE 350, CSE 525 (or concurrently).
Description: This course requires solving a real-world design problem in computer science and engineering. It uses hardware and software design methods and tools learned in previous coursework emphasizing teamwork, written and oral communication.
Course Attribute(s): CUE - This course fulfills the Culminating Undergraduate Experience (CUE) requirement for certain degree programs. CUE courses are advanced-level courses intended for majors with at least 90 earned credits/senior-level status., CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 602. Graduate Internship in Computer Science and Engineering** **2 Units**
Grading Basis: Pass/Fail
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): Admission to Graduate Study, Permission of Department Chair, and Permission of Director of Career Services.
Description: Supervised professional experience in industry at the graduate level. This course provides the structure and focus for the graduate intern field assignment to ensure that the assignment is appropriate and consistent with the intern's graduate course of study and professional development. Not to be counted towards meeting the requirements for a degree. May be repeated for credit.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 608. Advanced Design of Operating Systems** **3 Units**
Prerequisite(s): CSE 420.
Description: Formal study of algorithms arising in the engineering design of operating systems. Models will be designed and analyzed as to performance measures and optimality. Topics include management protection, security, concurrency, and resource allocation.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 609. Multimedia Processing** **3 Units**
Term Typically Offered: Spring Only
Prerequisite(s): CSE 302 or consent of instructor.
Description: This course aims to provide a broad introduction of Multimedia representation, encoding/compression, storage, and communication. It covers multimedia standards such as JPEG, H.261, and MPEG. It also aims to provide an experience with the use, integration, and content-based indexing and retrieval of audio, image, video, and textual sources for some multimedia applications and services.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 611. Computer Architecture** **3 Units**
Prerequisite(s): CSE 510, CSE 525, ECE 510, ECE 516 or equivalent.
Description: This course will provide in-depth exposure to advanced topics in computer architecture. The emphasis on studying and analyzing fundamental issues in computer architecture design and their impact on performance. Course topics include performance measurements; ISA; memory hierarchy design and cache memory; advanced pipelining; and advanced computer structures for instruction-level parallelism, instruction scheduling, data-level parallelism, and thread-level parallelism.
Note: Cross-listed with ECE 611.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 613. Network Security	3 Units	CSE 625. Parallel Programming	3 Units
Prerequisite(s): CSE 516.		Prerequisite(s): CSE 419 or equivalent.	
Description: This course provides basic knowledge and understanding of network security and vulnerability. The course also examines the internal mechanisms of various attacks and possible protection. Class participation, lab work, team projects, writing, and oral presentations will be integral components of the course.		Description: This course will provide an overview of parallel computation and algorithms, and teach basic parallel programming techniques. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)			
CSE 617. Mobile Computing	3 Units	CSE 627. Digital Image Processing	3 Units
Prerequisite(s): CSE 516.		Prerequisite(s): CSE 506, or ECE 420, or faculty consent.	
Description: Mobile communication and computing concepts, and related software development. Internal mechanisms by which mobile communication networks provide data transfer service for attached devices. Architecture of ad hoc networks and related protocols. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)		Description: A course that surveys basic concepts in image processing and pattern recognition. Topics included are: contrast and edge enhancement, histogram modification, image segmentation, feature extraction, statistical classifiers. Design problems involving computer implementation of algorithms are used extensively. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
CSE 619. Design and Analysis of Computer Algorithms	3 Units	CSE 628. Computer Graphics	3 Units
Prerequisite(s): CSE 310 and IE 360.		Prerequisite(s): CSE 302.	
Description: This course covers the interrelationship between algorithmic statements, data structures, and computational complexity of computer programs. Algorithms are presented for a number of computer science and engineering applications including graph problems, string matching, dynamic programming, transitive closure, and convolution. The properties of NP-complete problems are introduced. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)		Description: This course presents an introduction to computer graphics hardware and interactive engineering computer graphics techniques. Topics include engineering computer-aided design, graphics hardware (display processors and displays, hardcopy output devices, input devices), graphics standards and graphical kernel system, graphic object representation and transformation, interaction techniques, and three-dimensional graphics. Hardware graphics options are discussed and used. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
CSE 620. Combinatorial Optimization and Modern Heuristics	3 Units	CSE 629. Distributed System Design	3 Units
Prerequisite(s): CSE 419 or equivalent.		Prerequisite(s): CSE 420.	
Description: Combinatorial Optimization and Modern Heuristics presents classical and modern search and optimization concepts, methods, and applications. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)		Description: This course covers general concepts in the design and implementation of distributed systems, visiting topics in cluster computing, supercomputing, grid computing, and cloud computing. The course is composed of two building blocks: 1) distributing computing models including MPI and MapReduce programming, and 2) distributed storage techniques including networked, parallel, and distributed file systems. Our readings and discussions of research papers will help us understand general approaches to design, implement, and evaluate real distributed systems as well as identify open research problems. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
CSE 621. Web Mining for E-Commerce and Information Retrieval	3 Units	CSE 630. Advanced Databases	3 Units
Prerequisite(s): CSE 419 or equivalent.		Term Typically Offered: Spring Only	
Description: Fundamentals of knowledge discovery in semi-structured/unstructured data with emphasis on the World Wide Web: Web usage, content, and structure mining, applications to personalization, e-commerce, information retrieval, text mining. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)		Prerequisite(s): CSE 535 or consent of instructor.	
		Description: Object-relational databases; handling of complex types, XML and text in relational databases. NoSQL databases: data models and query languages. Data warehousing: design and implementation, query processing and optimization. Big Data: cluster computing, MapReduce and extensions, advanced analytical databases, distributed query processing. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)	
CSE 622. Simulation and Modeling of Discrete Systems	3 Units		
Prerequisite(s): IE 360.			
Description: Engineering design of simulation languages and simulators, discrete stochastic systems, issues in large scale simulation studies and engineering evaluation methods. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)			

- CSE 631. Database Security** **3 Units**
Prerequisite(s): CSE 535 or consent of instructor.
Description: This course covers basic issues in the field Security for database systems. Topics include Security Architecture, Administration of Users and Password Policies, Database Application Security Models, Virtual Private Databases and Label Based Access Control, Database Auditing Models, and Application Data Auditing. The course contributes to the following ABET goals: written communication, and contains heavy coverage of the following ABET goals: Knowledge of contemporary issues in the field of computer engineering and computer science. The understanding of professional and ethical responsibility in the field of computer engineering and computer science.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 632. Data Mining** **3 Units**
Prerequisite(s): IE 360 and CSE 335.
Description: Data mining concepts, methodologies, and techniques, including statistical and fuzzy inference, cluster analysis, artificial neural networks, and genetic algorithms, rule association and decision trees, N-dimensional visualization, Web and text mining, and advanced topics.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 633. Computer Vision** **3 Units**
Prerequisite(s): CSE 627 or ECE 618 or consent of instructor.
Description: Review of elementary pattern recognition and image processing; extension to advanced topics in computer vision, such as three-dimensional vision and perception, syntactic pattern recognition, motion, texture, and color vision applications.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 635. Data Mining with Linear Models** **3 Units**
Description: This course covers the theory and practice of linear models and mixed models as applied to different types of data.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 639. Advanced Industrial Software for Home Appliances (part A2)** **4.5 Units**
Term Typically Offered: Fall, Spring
Prerequisite(s): The student must be participating in the GE Appliance Edison program or employees at GE Appliances enrolled in the CSE program.
Description: This course provides graduate students working in the major home appliance industry with an advanced understanding of industrial software engineering and their application to technologies associated with the design, development, and production of major household appliances such as refrigerators, washers, dryers, cooking products and dishwashers. This course serves as one of the curricular elements for the GE Appliance Edison students and is limited to students participating in this program or employees at GE Appliances enrolled in the CSE program.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 640. Internet Application Design and Development** **3 Units**
Prerequisite(s): CSE 220.
Description: This course covers software design and development issues encountered in designing internet applications. Topics are HTML5 and CSS, HTTP and Servlet, JDBC, JSP Programming, Custom Tags and Java Bean, Connection Pooling, Web Application Architecture and Design, The Presentation Tier, The Business Logic Tier, The Persistence Tier, and Web Services.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 641. Medical Imaging Systems** **3 Units**
Prerequisite(s): ECE 555 or ECE 618.
Description: Focuses on the foundations of modern medical imaging. Topics include: X-ray generation and X-ray/tissue interactions, projection X-ray imaging, image reconstruction from projections, X-ray CT, MRI, nuclear medicine, SPECT, PET and Ultrasound.
Note: Cross-listed with ECE 641.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 645. Advanced Artificial Intelligence** **3 Units**
Prerequisite(s): CSE 545.
Description: Advanced topics in artificial intelligence from current research publications. Oriented toward second year graduate students. Major project required.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 646. Intelligent Systems** **3 Units**
Prerequisite(s): CSE 545.
Description: Advanced topics in artificial intelligence and intelligent systems, including machine learning, nontraditional logics, connectionist and evolutionary computing, autonomous robots, and intelligent monitoring and diagnosis of complex systems. A major project is required.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 660. Introduction to Bioinformatics** **3 Units**
Prerequisite(s): CSE 302 or CSE 503.
Description: Covers the current state of the art programs designed for sequence alignment, database searching, RNA structure prediction, microarray, sequence analysis, gene prediction, repeat detection, and protein folding prediction. A detailed analysis of the algorithms behind each of these will be explored. The algorithmic techniques discussed will include dynamic programming, hidden Markov models, finite state automata, grammars, Karlin-Altschul statistics and Bayesian statistics.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)
- CSE 690. Master of Science Thesis in Computer Science** **1-6 Units**
Description: Experimental and/or theoretical research to be presented in thesis.
For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 693. Independent Study in Computer Engineering and Computer Science 1-6 Units

Description: Guided study of one or more CSE topics of interest.
Note: Chair Approval is required.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 694. Special Topics in Computer Science and Engineering 1-6 Units

Description: Devoted to topics which usually are not treated in detail in the general course.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 695. Computer Engineering and Computer Science Seminar 1 Unit

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 696. CSE Project 3 Units

Prerequisite(s): Graduate standing in CSE.

Description: Independent design or experimental project in Computer Science and Engineering. Written and verbal reports required. Reports must include literature, speech, experimental methodology, design details, implementation details, test results, conclusions, and references. Verbal reports will be presented at a specified date each semester.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 697. Master of Engineering Thesis in Computer Engineering and Computer Science 1-8 Units

Prerequisite(s): Graduate/Professional standing.

Description: A candidate for the Master of Engineering degree, specializing in the field of Computer Engineering and Computer Science, is required to perform a study, design, or investigation under the direction of a faculty member. A written dissertation is required to be presented and defended orally and submitted to the faculty for approval.

Note: This course may be repeated for a maximum total of eight semester hours.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 790. Special Topics in Computer Science & Engineering 1-6 Units

Description: Devoted to advanced topics that are not treated in the general courses. Topics will be announced in the Schedule of Courses.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 795. CSE Seminar 1-4 Units

Grading Basis: Pass/Fail

Description: Seminar in Computer Science & Engineering

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 796. Independent Study in Computer Science & Engineering 1-6 Units

Prerequisite(s): Consent of advisor.

Description: Opportunity for the student, under the supervision of a sponsoring faculty member, to pursue individualized study related to research or practice that is not included in regular courses in the curriculum.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

CSE 799. Dissertation Research 1-24 Units

Prerequisite(s): Consent of advisor.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)